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The relationships of human success factor, information technology, and procurement process coordination on operational performance in building construction industry – A Proposed Conceptual Framework

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Abstract

Malaysian construction industry is one of the key economic sectors that has a significant contribution on national economic development with a steady contribution around 3-5% towards Gross Domestic Product (GDP) for the past 20 years. However, despite its growth and contribution to the GDP, this fragmented sector has a poor coordination among its project participants, leading to horrific material control with time and cost overrun. As such, there is a need to investigate the coordination aspect of the business conduct among project participants, particularly the procurement process that is considered as the initiator of construction project. At the same time, the firms' internal resources such as human success factor (HSF) and information technology (IT) play a significant part in determining the operational performance of construction project. Thus, the main objective of this study is to propose a conceptual framework on the relationships of internal resources (HSF and IT) and performance, mediated by procurement process coordination (PPC). The framework is using resource-based view as the underpinning theory to explain the relationships of the variables used. The scope of study is on one of the key business processes in supply chain management (SCM) and concentrating on one of the groups (G7) in the population. Future empirical research is expected to be carried out in effort to test this proposed conceptual framework.

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Keywords: Supply chain management; procurement; performance; human resource; information technology; construction

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1. Introduction

Supply chain management (SCM) is practiced by firms worldwide due to its abilities to reduce delivery time, improving financial performance, improving customer satisfaction, and building trust among suppliers and among others (Quesada, Gazo, & Sanchez, 2008). The implementation of supply chain in the industries such as manufacturing, logistics and distribution, has attained reasonable progress in business performance (Meng, 2012; Othman & Rahman, 2010).

However, as opposed to supply chain in manufacturing, construction supply chain is more difficult and consists of a greater number of key participants, for instance project clients, consultants, main contractors, specialist contractors, and various suppliers (Meng, 2012). In recent years, researchers have underlined the benefits of supply chain management philosophy to the construction industry in effort to maximize the performance of construction and minimize waste initiated by inefficient materials management and control (Irizarry, Karan, & Jalaei, 2013; McDermott & Khalfan, 2012; Saad, Jones, & James, 2002). The essential for effective materials management has also been extensively acknowledged throughout the industry due to the benefits this practice offers (Irizarry et al., 2013).

One of the growing trends in construction supply chain is management of procurement process. Procurement is significantly important to the construction industry. As highlighted by Sundraj (2007), inefficient and ineffective methods of practices in procurement is among other weaknesses that were inherited by construction industry in Malaysia. Furthermore, material procurement accounts for more than 50% of the total construction project costs (Dubois & Gadde, 2002; Othman, 2011).

In effort to improve the effectiveness of traditional procurement process, the term procurement process coordination (PPC) had been introduced by Othman (2011) which emphasizes on coordination of procurement activities between contractors and suppliers. This is important particularly in the construction industry in which the industry is naturally specialised and fragmented (Bemelmans, 2012; Mirawati, Othman, & Ismail, 2013; Nawi, Anuar, & Lee, 2013; Othman, 2011; Proverbs, Holt, & Cheok, 2000). Due to the fragmented nature of the construction industry, coordination is required to deal with the interdependencies and complexities of activities and processes (Othman, 2011).

Recent studies show that internal resources (human factor and information technology) had gained interest in the study regarding firm performance. Human resources have become more significant and strategically valuable in today's competitive environments (Ertemsir & Bal, 2012). Consistent with growing interest on human capital study, studies on information technology (IT) in construction industry is also gaining recognition (Aziz & Salleh, 2014). The improvement of computer and telecommunication technology enables firms to enhance the efficiency of transaction between the firms and suppliers via information sharing and advanced IT utilization in communication (Kim, 2012). A balanced integration of human skills and technology could improve firm performance and facilitate the achievement of competitive advantage (Martín-Rojas, García-Morales, & Bolívar-Ramos, 2013).

2. Literature

Intangible firm-specific resources like human capital and experience allow firms to increase value associated with incoming factors of production thus creating competitive advantage for a firm (Javalgi & Todd, 2011). Using resource based view (RBV) as underpinning theory, research in applied psychology and strategic human resource management evidently shows that investing in human capital can produce progressive individual as well as organization-level performance results (Crook, Todd, Combs, Woehr & Ketchen, 2011). However, as RBV matured, researchers do not just correlate aggregate human capital with performance but are also investigating the processes by which managers give influence to it (Crook et al., 2011).

A meta-analysis between human capital and firm performance conducted by Crook et al. (2011) found that human capital in the view of resource based view (RBV) theory, is positively significant to performance. In contrast, Mahsud, Yukl and Prussia (2011) suggested otherwise. Though there is a strong relationship between human and performance, Mahsud et al. (2011) said that “the effect of human capital on firm performance is indirect, having its effect on factors that are proximal antecedents of firm performance”, in accordance to flexible leadership theory. Unfortunately, although prior research has studied the direct relationship between human capital and firm performance, it has insufficiently studied the intervening processes (Mahsud et al., 2011). Construction industry is

considered as most people-intensive sector (Shukor, Mohammad, Mahbub, & Halil, 2009), yet most organisations overlook on this aspect (Aziz & Salleh, 2014).

Consistently, Aziz and Salleh (2014) discovered that implementing IT into construction's business activities had simplified traditional business practice, resulting tasks to be completed in the shortest time possible and inexpensive. In supply chain, the use of technologies has the capability to provide operational benefits such as reduction in cost and improvement in services, and strategic benefits such as improvements in product planning and innovation (Prajogo & Sohal, 2013).

In addition, several studies in the construction industry generally found positive impact of the utilization of IT on various performance measures such as cost, schedule, safety performance and construction firm performance (Kang, OBrien, & Mulva, 2013). Numerous researchers have debated the possible benefits of IT application in construction industry for over a decade (Aziz & Salleh, 2011; Chien & Barthorpe, 2010; Davies, 2008; Love & Irani, 2010; Tse & Choy, 2005). Decreasing cost of construction, improvement in service delivery quality, growing capacity of government, improving decision making process, and transparency, and increasing efficiency and immediate access to pertinent information, are among the paybacks of IT application in construction industry (Aziz & Salleh, 2011). However, the informed benefits are very much inconsistent (Kang et al., 2013). Among the reasons for the inconsistency include "measurement errors from inputs and outputs, time lags in the payoffs to IT, redistribution and dissipation of profits, mismanagement of information and technology, sample size and data source issues, industry type differences, choice of the dependent variable(s), and modelling issues" (Kang et al., 2013). Xue (2012) claimed that excessive reliant on pure technologies and overlooking organizational culture, change, and the cognitive level and behavioural habits of people may lead to unsuccessful applications of IT.

Moreover, in the context of construction industry in which it is fragmented in nature both geographically and functionally (Aziz & Salleh, 2011), difficulties in managing human resources as well as implementation of technologies in the industry are unavoidable. Contractors are increasingly becoming more dependent on suppliers to complete projects while striving for the required performance in these projects (Bemelmans, 2012). Due to the fragmented nature of the construction industry, coordination is important in dealing with the interdependencies and complexities of activities and processes (Othman, 2011).

Arshinder, Kanda, and Deshmukh, (2008) proposed that coordinated procurement process can enhance the firms' performance by integrating the coordination and communication mechanism in the traditional procurement process. Even though there are many evidence showing benefits that industries such as manufacturing and retailing had gained from effectively managing supply chain coordination, there is however limited evidence of its success and its impact in construction industry (Othman, 2011).

Previous construction literature stated that processes should be taken into account together with other factors such as people, procurement, legal issues, and knowledge management for successful application of IT (Kang et al., 2013). This idea builds up the foundation of theoretical framework for this research, including both IT and human success factors as determinants to operational performance.

3. The Proposed Framework

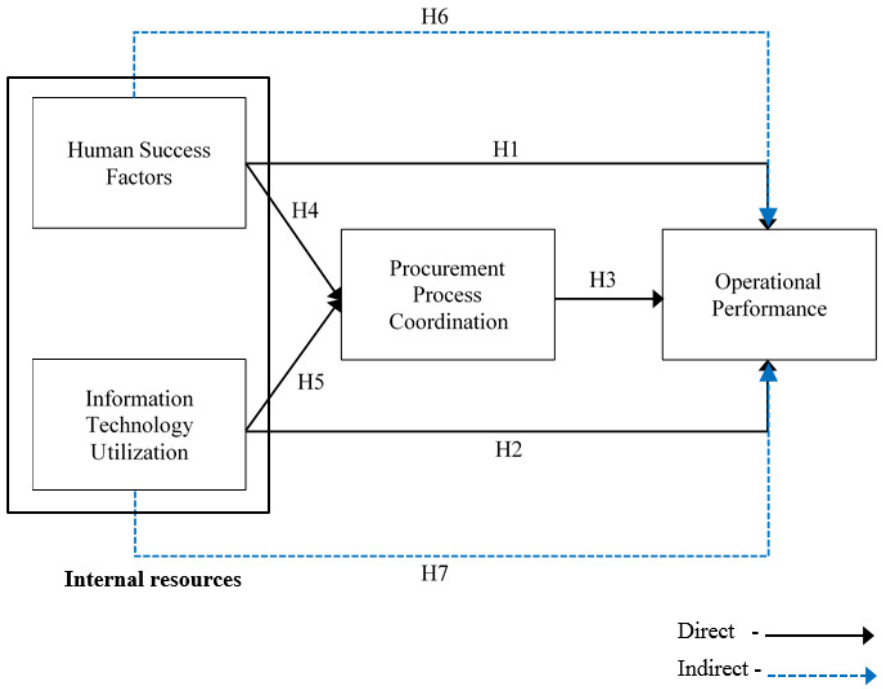

Figure 1 Proposed framework on the relationships of human success factor, information technology, and procurement process coordination on operational performance.

Figure 1 illustrates the proposed framework for the relationships of internal resources (human success factor and information technology) and procurement process coordination on operational performance. This framework is conceptualized based from previous work of others (Crook et al., 2011; N. Kim & Pae, 2007; Mahsud et al., 2011; Nativi & Lee, 2012; Othman, 2011).

Human capital is considered a valuable resource that is specific and inimitable, which enables the firms to sustain their competitive advantage (Chowdhury, Schulz, Milner & Van De Voort, 2014). Research suggested that when human capital is linked with fundamentally sound business practices, high performance would follow (Crook et al., 2011). That being said, human capital itself represents the general human factors available to organisation. The organization must specify factors that are critical for the organization to succeed, leading to the term 'success factor' in prior literature (Aziz & Salleh, 2014). In this research, human success factors which include employees training and top management support, are selected as one of the determinants in the framework.

Complementing human factors in this framework is IT utilization. Prior literature states that the utilization of IT is expected to enhance both financial and operational performances (Liang, You & Liu, 2010). However, Perez-Arostegui et al. (2012) specify that IT can produce a competitive advantage only if it is complemented by a set of pre-existing human and business resources in the organization (Kim & Pae, 2007; Nativi & Lee, 2012). With previous literature supporting the idea of complementary resources (Perez-Arostegui et al., 2012), this framework will take into account human factors and IT utilization as internal resources that complement each other.

While human success factors and IT utilization are considered as complementary resources, they are also being considered to have an indirect relationship with operational performance. This framework proposed human success factors to have indirect relationship to operational performance. The effect of employees on performance is expected to be indirect as the effect is uniform with empirical research indicating a delayed effect of human capital on firm performance (Kehoe & Wright, 2010; Mahsud et al., 2011). Correspondingly, Kang et al. (2013) claimed that IT

does not directly affect performance, but rather it affects organizational resources that in turn affect performance. IT does not have a direct effect on productivity. Instead, IT affects work processes that will affect productivity.

In construction industry, procurement is considered as an initiator to other processes (Arshinder, Kanda, & Deshmukh, 2006). Procurement is significantly important as it accounts for more than 50% of the total construction project costs (Dubois & Gadde, 2002; Othman, 2011). However, since procurement process is not managed by one entity, issues such as information asymmetry and double marginalization could contribute to inefficient performance of the process (Hu, Lim & Lu, 2013)**.** In effort to improve the performance efficiency, coordination models had been developed in optimizing supply chain integrated systems (Rahdar & Nookabadi, 2014).

Coordination of activities is crucial among different entities in the supply chain to ensure effective management (Hu et al., 2013). Especially in construction industry which is known to be fragmented and specialised in nature (Bemelmans, 2012; Mirawati et al., 2013; Nawi et al., 2013) , coordination among supply chain members is essential to ensure management effectiveness and efficiency (Hu et al., 2013; Othman, 2011). Accordingly, coordinated procurement process introduced by Othman (2011) which emphasizes on coordination of procurement activities between contractors and suppliers in construction industry, is to deal with the interdependencies and complexities of procurement processes among chain members (contractors and suppliers).

As such, procurement process coordination could have influence on performance improvement (Othman, 2011). In line with the delayed effect of the human factors to firm performance (Kehoe & Wright, 2010; Mahsud et al., 2011), and inconsistent findings regarding benefits of IT use to performance (Kang, OBrien, & Mulva, 2013), coordinated procurement process could explain on these two issues.

The direct effect of human with strong skills and motivation is that they tend to work faster and smarter, which consequently leads to better performance (Kehoe & Wright, 2010; Mahsud et al., 2011). The delayed effect of employees to performance should be better explained by the presence of coordinated procurement process, as trained employees would be better in managing the procurement process that in turn lead to better operations of the organisation. On the other hand, Ekstrom and Bjornsson (2004) stated that reengineering of procurement processes together with investments in IT could lead to improved productivity. Therefore, in an effort to improve the operational performance of construction industry, this framework proposed coordinated procurement process as mediating variable to mediate the relationship between the internal resources (human success factors and IT utilization) and operational performance.

4. Conclusion

This paper in general is to enrich existing literature on supply chain management, specifically in the area of supplier relationship management or procurement process in construction industry. This paper also provides new insights on human variables that can enhance current operational performance in the context of construction industry in Malaysia, at the same time extending current literature on how IT can enhance operational performance in the context of construction industry in Malaysia. Finally, the framework established in this study is to offer clearer picture on how human issues and information technology mediated by PPC could somehow help in delivering better operational performance of construction firms. Future research is to validate this framework statistically by using empirical data and the structural equation modelling (SEM) approach.

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